Sensitivity study of the radiance to optical and microphysical properties of nonspherical dust aerosols

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Aerosols influence the atmospheric radiation balance not only through directly absorbing and scattering solar radiation, but also altering the radiation properties of clouds by acting as cloud condensation nuclei. Tropospheric aerosols have been considered the most uncertain part of the climate forcing [1]. For a cloud-free and dusty pixel, the radiance measured by the airborne instrument is affected by the optical depth and single-scattering properties. Single-scattering properties are mainly determined by particle size, complex refractive index and particle aspect ratio [2].

To understand and quantify how much these parameters affect the visible and infrared radiance measured by the Airborne Multiangle SpectroPolarimetric Imager (AirMSPI), the sensitivities of the radiance to the optical and microphysical properties (i.e., particle size, complex refractive index and particle aspect ratio) of nonspherical aerosol were studied at the wavelengths of AirMSPI's bands with polarization (i.e., 470, 660, and 865 nm) [3]. An existing tri-axial ellipsoidal mineral dust aerosol database was employed to carry out this study [4,5]. This study will benefit the development of aerosol retrieval algorithm with polarization and multi-angle AirMSPI data.

References

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